Vestibular Migraine in Perimenopausal Women: Prevalence and Effect of Integrated Exercises on Balance, Disability, Electroencephalogram and Quality of Life

SHORT SYNOPSIS

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by

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Certificate

I hereby declare that the short synopsis **"Vestibular Migraine in Perimenopausal Women: Prevalence and Effect of Integrated Exercises on Balance, Disability, Electroencephalogram and Quality of Life"** being submitted in partial fulfillment of the requirement for the degree of Doctor of Philosophy in the Department of Physiotherapy. under School of Allied Health Sciences of Manav Rachna International Institute of Research & Studies, Faridabad during the academic year 2025. It is a bonafide record of original work carried out under the supervision of Dr.Kshitija Bansal and has not been submitted in full or part to any other university or institute for degree or diploma. Further, it is certified that short synopsis is plagiarism free and proof has been submitted.

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ABSTRACT

Vestibular migraine (VM) is a neurological condition characterized by the coexistence of migraine and vestibular symptoms such as vertigo, dizziness, and imbalance. It is more prevalent in women, with incidence peaking during perimenopause due to hormonal fluctuations, particularly in estrogen levels. These hormonal changes destabilize the trigeminovascular system, exacerbating migraine-related symptoms and vestibular dysfunction. Perimenopausal women are especially vulnerable, with many experiencing worsening VM symptoms or a new onset of vestibular issues during this transitional phase.

VM significantly impacts balance and spatial orientation, leading to challenges in daily functioning and a reduced quality of life. The prevalence of VM in this population is notable, with up to 30% of women with migraines experiencing vertigo or dizziness. Despite its impact, VM remains underdiagnosed, and the interplay between hormonal fluctuations, vestibular dysfunction, and migraine pathophysiology is not fully understood. Addressing this gap is crucial for developing targeted diagnostic and management strategies. This study aims to explore the effects of VM on balance and quality of life in perimenopausal women, providing insights into its diagnosis and treatment.

Keywords: Vestibular Migraine, Perimenopausal women, Hormonal Fluctuations, Balance impairments, Quality of Life

CONTENT

S. No.	Description	Page No.
1	Introduction	5-7
2	Literature Review	7-9
3	Research Gaps and Problem Statement	10
4	Research Objectives	11
5	Research Methodology	12-28
6	References	29-31
7	Annexures	32-37

1. INTRODUCTION

During childhood, the prevalence of migraine is the same for both men and women; however, following puberty, when women begin menstruation, the prevalence of migraine is higher in women than in males (Allais, G. et. al, 2020). After menarche, the occurrence of migraines in women rises significantly, with the highest prevalence observed around the age of 42 and a gender ratio of 3:1 favoring women (Jeong 2020). Perimenopause, the transitional phase leading to menopause, is marked by fluctuating estrogen levels, which can exacerbate the frequency and intensity of migraine attacks, including vestibular migraine (Harriott & Schwedt, 2021).

The link between migraines and hormonal changes has long been recognized, with estrogen believed to play a significant role in modulating the trigeminovascular system, a key pathway in migraine pathophysiology (Martin & Behbehani, 2006). During perimenopause, the declining and fluctuating levels of estrogen can destabilize this system, leading to an increase in migraine-related symptoms, including vertigo, dizziness, and imbalance. These vestibular symptoms may occur with or without the classical headache component of migraine, making diagnosis challenging (von Brevern & Lempert, 2021).

Women in perimenopause may experience worsening of their VM symptoms or even a new onset of vestibular symptoms during this period (Bussone et al., 2013). The hormonal volatility of perimenopause not only impacts migraine frequency but also increases the severity of vestibular symptoms, which can significantly impair the quality of life. Current management strategies often focus on hormonal regulation, lifestyle modifications, and pharmacological interventions, with an emphasis on individualized care to address the unique needs of perimenopausal women (MacGregor, 2020).

Vertigo and dizziness are common complaints in women, particularly during the perimenopausal transition. Vestibular migraine (VM), a subtype of migraine associated with vertigo, has been increasingly recognized as a significant cause of dizziness in this population. Studies suggest that hormonal fluctuations during perimenopause contribute to a higher prevalence of migraine and related vestibular symptoms, with up to 30% of women with migraines experiencing vertigo or dizziness during perimenopause (Harriott & Schwedt, 2021; Bussone et al., 2013). The complex interplay between declining estrogen levels and the modulation of central vestibular pathways is believed to exacerbate VM symptoms during this transitional phase (Martin & Behbehani, 2006).

The prevalence of VM in perimenopausal women is particularly notable due to the well-established relationship between hormonal changes and migraine exacerbation. As estrogen levels fluctuate, there is a higher likelihood of experiencing both headaches and vestibular symptoms, such as vertigo, imbalance, and dizziness (Neuhauser et al., 2001). While migraine prevalence generally peaks between the ages of 35 and 45, it remains highly prevalent in the perimenopausal years, with reports indicating that up to 70% of women with a history of migraine experience a worsening of symptoms during this period (Vetvik & MacGregor, 2017). Additionally, VM is frequently underdiagnosed, as many women report dizziness without recognizing it as part of their migraine symptoms (von Brevern & Lempert, 2021).

Given the significant impact on quality of life, it is essential to recognize and address VM in perimenopausal women. Accurate diagnosis and management strategies tailored to this demographic can help mitigate the burden of vestibular symptoms and improve overall well-being.

Vestibular migraine (VM) is a prevalent condition that significantly impacts balance and spatial orientation, making it one of the leading causes of recurrent dizziness in the general population. Characterized by episodic vertigo or dizziness, VM often results in impaired balance, which can severely affect daily functioning and quality of life (von Brevern & Lempert, 2021). This impairment is due to the involvement of the vestibular system, which plays a critical role in maintaining balance and equilibrium. During a VM episode, patients frequently report sensations of spinning, disequilibrium, and unsteadiness, which can lead to difficulties in walking, standing, and performing other activities requiring postural stability (Dieterich & Brandt, 2015).

The balance disturbances in VM are believed to be caused by altered sensory integration between the vestibular, visual, and proprioceptive systems, all of which are crucial for maintaining postural control. Cortical spreading depression and the activation of the trigeminovascular system, both key mechanisms in migraine pathophysiology, are thought to disrupt central vestibular processing, leading to balance issues (Furman et al., 2013). Unlike other vestibular disorders, VM is often accompanied by migraine-specific symptoms such as headache, photophobia, and phonophobia, further complicating the ability to maintain balance (Lempert et al., 2012).

Patients with VM may experience persistent postural-perceptual dizziness (PPPD), where balance problems persist even after the acute vertigo subsides (Staab, 2017). This chronic dizziness can create a vicious cycle of anxiety and fear of falling, exacerbating balance problems and leading to further disability. Addressing VM's impact on balance is essential in treatment plans, which often involve a combination of pharmacological therapy, vestibular rehabilitation, and lifestyle

modifications to restore equilibrium and reduce the frequency of vertigo episodes (Lempert & Neuhauser, 2009).

1.1 Significance of the study

This study is significant as it explores the impact of vestibular migraine (VM) on balance in perimenopausal women, a population particularly vulnerable to hormonal fluctuations. Understanding how VM exacerbates balance disturbances during this transitional phase can provide insights into the unique challenges faced by these women. The findings will contribute to better diagnostic and treatment strategies, potentially reducing fall risks and improving quality of life. Additionally, this research will address the gap in current literature, guiding clinicians toward more effective management of VM in perimenopausal patients.

2. REVIEW OF LITERATURE

2.1 Vestibular Migraine: Clinical Profile, Comorbidities, and Therapeutic Response

Vestibular migraine exhibits a bimodal pattern, likely influenced by hormonal factors in women. Patients with this condition often present a complex clinical profile, which may include autonomic, inflammatory, or connective tissue disorders, as well as a higher prevalence of psychological symptoms. These characteristics can sometimes lead to misdiagnosis as a functional neurological disorder. Additionally, a significant proportion of individuals with persistent postural-perceptual dizziness exhibit a migraine phenotype. Regardless of their clinical presentation or medical history, individuals with vestibular migraine generally respond well to standard migraine preventive therapies, including treatments targeting calcitonin gene-related peptide pathways (Maria D. Villar-Martineza and Peter J. Goadsby;2024).

2.2 Hormonal Influences on Migraine: Menstrual and Perimenopausal Patterns and Management Strategies

Research suggests that the increased likelihood of migraines during menstruation and perimenopause is likely linked to fluctuations in estrogen levels. Prolonged, severe, and challenging-to-treat headaches often characterize menstrual migraines (MM). For these cases, the use of long-acting triptans or a combination of triptans with common analgesics is recommended. Additionally, short-term preventive measures, such as triptan therapy or estrogen supplementation, may be effective for women with regular menstrual cycles or those using combined hormonal contraceptives. Conventional preventive strategies can also be considered based on the severity of disability caused by migraines and the occurrence of non-

menstrual attacks. For perimenopausal migraines, hormonal treatments should focus on stabilizing estrogen levels to minimize fluctuations. Further research into migraine treatments should explore the interaction between female sex hormones and migraine pathogenesis, particularly the role of the calcitonin gene-related peptide pathway (Raffaele Ornello et al;2021).

2.3 Perimenopausal Transition and High-Frequency Headaches: Hormonal Shifts and Confounding Influences

The risk of experiencing high-frequency headaches increases by 1.4 times during perimenopause compared to the premenopausal phase in fully adjusted models. Similarly, while the risk also appears elevated during menopause in models adjusted for sociodemographic factors, this significance diminishes in fully adjusted models. This indicates that the impact of menopause on high-frequency headaches may be influenced or confounded by factors such as medication overuse or depression. In contrast, distinct mechanisms seem to contribute to the increased risk during perimenopause (Vincent T. Martin et al; 2016).

2.4 Ovarian Neurosteroid Fluctuations and Vestibular Migraine in Perimenopause: A Misunderstood Phenomenon

The prevalence of migraine disorders is higher in women than in men. This gender disparity is largely caused by ovarian neurosteroids, which alter neurotransmitter systems involved in migraine development. In contrast to the postmenopausal phase, women have erratic changes in their ovarian neurosteroid levels during the perimenopause. These kinds of variations could be a significant interval-specific migraine cause. Dizziness is one of the most prevalent perimenopausal complaints, along with migraine headaches. A considerable amount of dizziness could be attributed to vestibular migraine, which presents a variety of clinical symptoms, including headache and/or dizziness. Due to this diversity in phenomenology, the perimenopausal symptoms of vertigo and dizziness are sometimes mislabeled as psychologically based or nonspecific climacteric symptoms (J.H. Park, 2010).

2.5 Reproductive Hormonal Milieu and Its Role in Migraine Pathogenesis Across a Woman's Lifespan

The migraine headaches are significantly influenced by reproductive events throughout a woman's life. Each of these events is associated with a distinct "hormonal milieu," which can shape the clinical progression of migraines. Depending on their serum levels, consistency of

exposure, and the specific types of estrogen and progesterone derivatives, these hormones may either alleviate or trigger migraines. Additionally, migraine attacks with and without aura exhibit differing responses to fluctuations in ovarian hormone levels. A deeper understanding of ovarian hormones and their role in migraines is crucial for advancing knowledge of the mechanisms and pathogenesis underlying this condition (Vincent Martin; 2006).

3. Statement of the Problem

Vestibular migraine (VM) is a neurological condition characterized by the combination of migraine and vertigo symptoms, often resulting in significant balance and spatial orientation issues. Women, particularly those in the perimenopausal phase, are more susceptible to both migraines and vestibular disorders, with hormonal fluctuations during this period contributing to the increased prevalence of VM. While the link between hormonal changes and migraine severity is well-documented, the specific effects of VM on balance in perimenopausal women remain insufficiently studied. Balance disturbances associated with VM can severely impact daily functioning—affecting posture, mobility, and routine activities—ultimately reducing quality of life. This population may also face an elevated risk of falls, anxiety, and functional impairments. Despite these concerns, there is a notable lack of research exploring the complex relationship between VM, hormonal transitions, and balance, highlighting the need for further clinical investigation and targeted interventions.

4. Research Gaps:

1. Limited studies focus on the prevalence of vestibular migraine (VM) specifically in perimenopausal women, despite the unique hormonal fluctuations and increased susceptibility during this period.
2. There is insufficient data on the extent to which VM impacts balance and daily functioning in this demographic, particularly regarding its influence on the risk of falls and associated disability.
3. Current literature lacks comprehensive tools or approaches for assessing VM-related balance impairments in perimenopausal women.
4. While exercise-based interventions have shown promise for VM management, their specific impact on balance, neuronal activity (via EEG), and quality of life in perimenopausal women remains underexplored.
5. There is a gap in evidence-based integrated exercise protocols that address VM's multifaceted effects, combining balance training, vestibular rehabilitation, and relaxation techniques.
6. Limited research exists on the use of EEG as a diagnostic or monitoring tool to evaluate neuronal changes in response to interventions for VM in this population.

Aim and Objectives

PHASE I

AIM: To determine the prevalence of vestibular migraine and its impact in perimenopausal women among women aged 42 to 55 years

OBJECTIVES:

1. To estimate the prevalence of vestibular migraine in perimenopausal women.
2. To evaluate the impact of vestibular migraine on balance in perimenopausal women
3. To evaluate the level of disability in perimenopausal women with vestibular migraine.

RESEARCH QUESTION

1. What is the prevalence of vestibular migraine among perimenopausal women?
2. What is the impact on balance due to vestibular migraine among perimenopausal women?
3. What is the level of disability in perimenopausal women with vestibular migraine?

PHASE II

AIM: To evaluate the effectiveness of an integrated exercise protocol on balance, electroencephalogram activity and quality of life in perimenopausal women diagnosed with vestibular migraine.

OBJECTIVES:

1. To evaluate the effectiveness of an integrated exercise protocol on balance, electroencephalogram, level of disability and Quality of Life in perimenopausal women with vestibular migraine.
2. To evaluate the effectiveness of Conventional therapy on balance, electroencephalogram, level of disability, and Quality of Life in perimenopausal women with vestibular migraine.
3. To compare the effectiveness of an integrated exercise protocol and conventional therapy on balance, electroencephalogram, level of disability, and Quality of Life in perimenopausal women with vestibular migraine.

METHODOLOGY

PHASE I

- **Study Design:** Cross-sectional study
- **Study Setting:** Community in Delhi/NCR

  Subjects: Perimenopausal women (STRAW criteria)

  Sampling Technique: Purposive sampling will be used in this study.

  Sample Size: 385 (Slovin's formula)

  Study Duration: The study will be of 3-6 months.

Inclusion Criteria

1. **Age:** 42-55 years
2. Women currently experiencing perimenopausal symptoms (STRAW criteria)
3. Ability to understand English
4. Willingness to participate

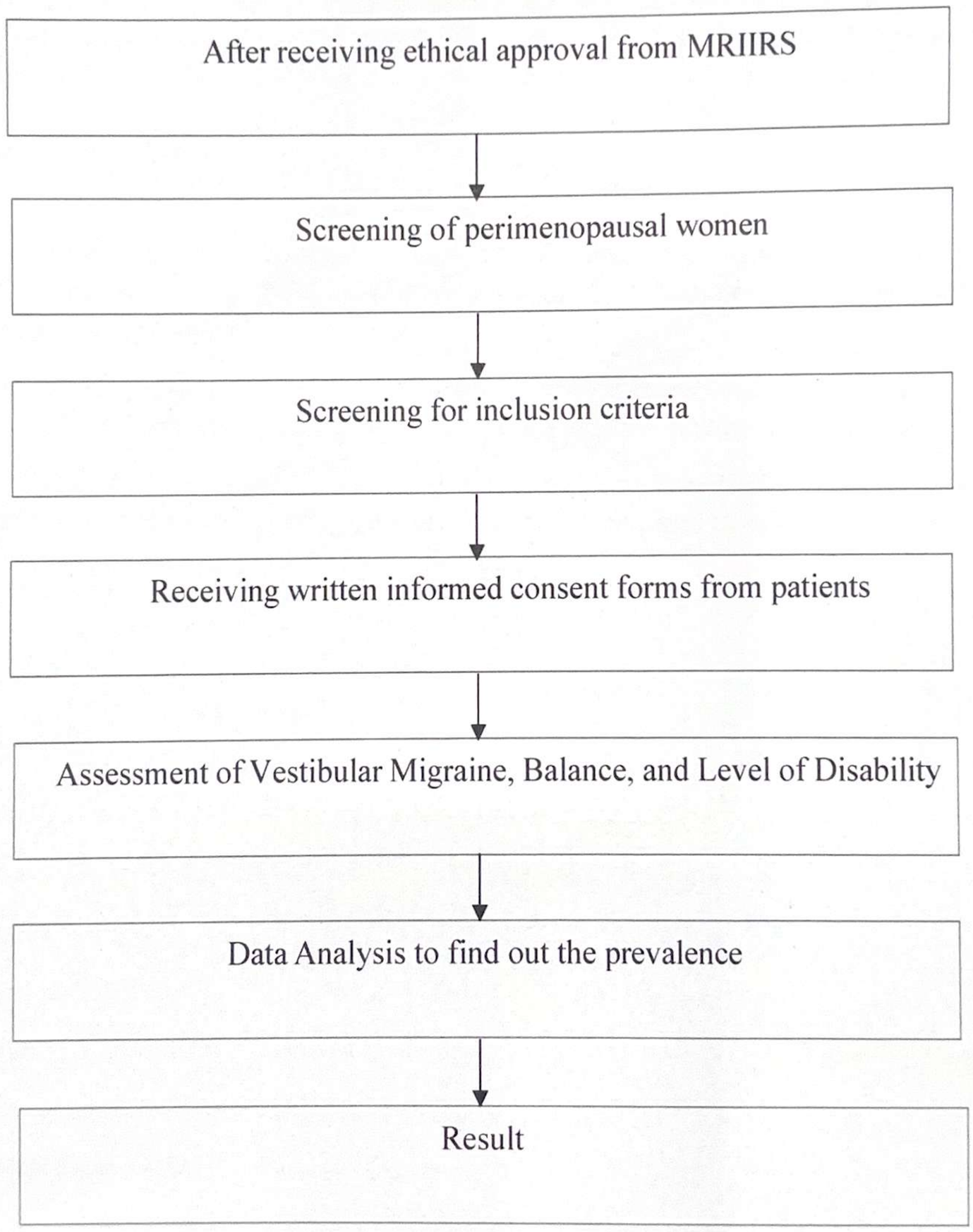
Exclusion Criteria

1. Women who have undergone hysterectomy or oophorectomy
2. Uncontrolled hypertension and diabetes or hormone replacement therapy (HRT)
3. Diagnosed with neurological disorders (e.g., epilepsy, multiple sclerosis) or vestibular disorders (e.g., Meniere's disease, benign paroxysmal positional vertigo)
4. Chronic use of medications affecting balance like sedatives, anticonvulsants, antidepressants
5. Women with significant lower limb and cervical musculoskeletal disorders or injuries, including fractures in the last 6 months
6. Women with uncorrected vision or hearing impairments

Outcome Measures

- **International Classification of Headache Disorders (ICHD-3)** for diagnosing vestibular migraine.
- **Star excursion balance test and Berg Balance Scale** to measure multidirectional issues in balance.
- **Migraine Disability Assessment (MIDAS) Scale** to measure the level of disability due to vestibular migraine.

PROCEDURE


After receiving ethical approval from MRIIRS
Screening of perimenopausal women
Screening for inclusion criteria
Receiving written informed consent forms from patients
Assessment of Vestibular Migraine, Balance, and Level of Disability
Data Analysis to find out the prevalence
Result

PHASE II

Null Hypotheses (H_0):

1. There will be no significant effect of an integrated exercise protocol on balance, electroencephalogram, level of disability and Quality of Life in perimenopausal women with vestibular migraine.

2. There will be no significant effect of Conventional therapy on balance, electroencephalogram, level of disability, and Quality of Life in perimenopausal women with vestibular migraine.

3. There will be no significant effect of an integrated exercise protocol and conventional therapy on balance, electroencephalogram, level of disability, and Quality of Life in perimenopausal women with vestibular migraine.

Alternate Hypotheses (H_1):

1. There will be a significant effect of an integrated exercise protocol on balance, electroencephalogram, level of disability and Quality of Life in perimenopausal women with vestibular migraine.
2. There will be a significant effect of Conventional therapy on balance, electroencephalogram, level of disability, and Quality of Life in perimenopausal women with vestibular migraine.
3. There will be a significant effect of an integrated exercise protocol and conventional therapy on balance, electroencephalogram, level of disability, and Quality of Life in perimenopausal women with vestibular migraine

METHODOLOGY:

- **PHASE II:**

  Study Design: Experimental study with 2 parallel groups

  Study Setting: Cohort from phase I suffering from Vestibular Migraine and having balance deficits

  Subjects: Perimenopausal women with Vestibular Migraine and balance deficits

  Sampling Technique: Purposive sampling with random allocation will be used in this phase

  Study Duration: The duration of the study will be 6 weeks

  Sample Size: Using G-Power: (based on Pilot Study) 10 subjects

Inclusion criteria:

1. Perimenopausal women with diagnosed vestibular migraine
2. Age: 42-55 years
3. BMI: 18.5kg/m2-29.9kg/m2 (Normal to Pre-obesity according to WHO)
4. Berg Balance Scale (BBS) score ≤ 40
5. MIDAS score ≥ 11

Exclusion criteria:

1. Uncontrolled hypertension and diabetes
2. Diagnosed with neurological disorders (e.g., epilepsy, multiple sclerosis) or vestibular disorders (e.g., Meniere's disease, benign paroxysmal positional vertigo)
3. Women with significant musculoskeletal disorders or injuries in last 6 months
4. Women with uncorrected vision or hearing impairments
5. Any recent surgeries in the last 6 months

Instrumentation:

- **Berg Balance Scale:** The Berg Balance Scale is a widely used clinical tool designed to assess an individual's static and dynamic balance abilities. It consists of 14 functional tasks, such as sitting to standing, standing with eyes closed, turning 360 degrees, and retrieving an object from the floor. Each item is scored on a 5-point scale (0 to 4), with a maximum total score of 56. Higher scores indicate better balance performance. The BBS is commonly used in elderly populations and individuals with neurological or musculoskeletal conditions (e.g., stroke, Parkinson's disease, or vestibular disorders) to identify balance impairments and fall risk. A score below 45 is generally considered indicative of a higher fall risk.
- **Star Excursion Balance Test**: The Star Excursion Balance Test (SEBT) is a dynamic balance assessment tool used to evaluate lower limb strength, neuromuscular control, and postural stability. It requires the individual to stand on one leg while reaching as far as possible with the other leg in multiple directions—typically anterior, posteromedial, and posterolateral—forming a star-like pattern.
- **Migraine Disability Assessment Scale (MIDAS):** The Migraine Disability Assessment Scale (MIDAS) is a brief, self-administered questionnaire designed to measure the impact of migraines on a person's daily life. It assesses disability over the past three months by asking

about the number of days migraines have affected work, school, household chores, and social or leisure activities. The MIDAS consists of five main questions, with scores added to give a total disability score, which categorizes the impact from little or no disability to severe disability: 0–5: Little or no disability, 6–10: Mild disability, 11–20: Moderate disability, 21+: Severe disability

- Electroencephalography (EEG) machine (EMOTIV **EPOC X - 14 Channel Wireless EEG Headset)**
- **QoL: World Health Organization Quality of Life Questionnaire Short Form - 12(WHOQL-SF12):** WHOQOL-SF12 is a brief version of the WHOQOL assessment tool developed by the World Health Organization to measure the quality of life across various domains of health and well-being. It includes 12 items derived from the longer WHOQOL instruments and is designed for quick screening in clinical and research settings. The questionnaire assesses key areas such as Physical health, psychological well-being, Social relationships, Environment

Dependent Variables

- Balance
- Migraine Disability
- Brain neuronal activity
- Quality of life

Independent Variables

- Integrated exercise protocol

PROCEDURE:

- 2 groups will be made.
- Females in both Group 1 and Group 2 will be diagnosed with vestibular migraine according to the **International Classification of Headache Disorders (ICHD-3)** diagnostic criteria and will be cross-verified by a physician.

Group A (Experimental Group):

Group A will receive an integrated exercise intervention including Vestibular Rehabilitation which consists of gaze stabilization, habituation exercises, and vestibulospinal reflex exercises. The complete weekwise protocol is given in Table 1.

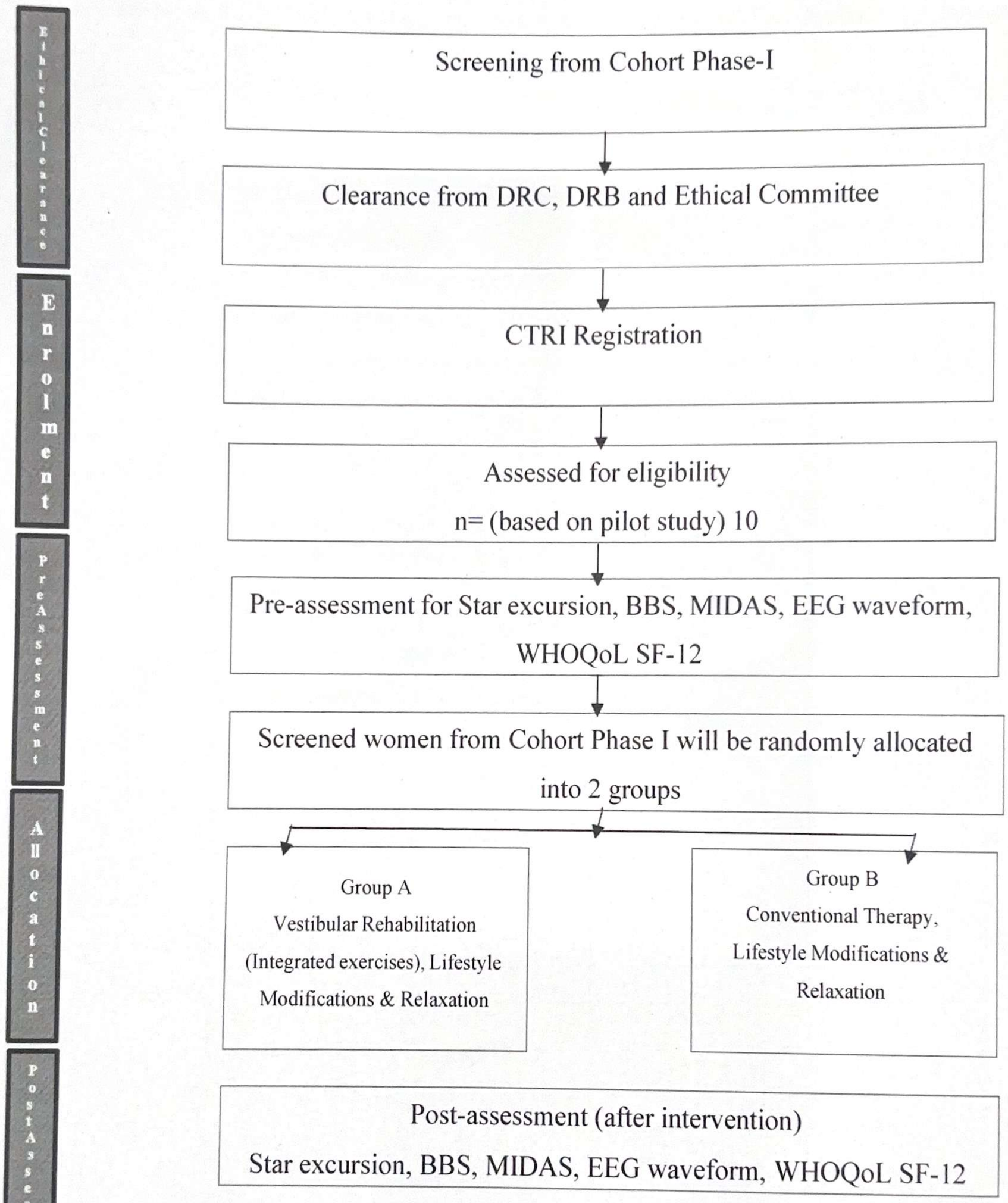
Group B (Control Group):

The control group will receive conventional therapy including strengthening exercises of the neck muscles. The complete weekwise protocol is given in Table 2.

Group A+ Group B:

Both groups will receive lifestyle modification and relaxation techniques, which will be explained verbally, and participants will also be provided with pamphlets. Participants will also be asked to maintain a daily diary to keep track of the same (Refer to Table 3).

PROCEDURE


Ethical Clearance
Enrolment
Pre Assessment
Allocation
Post Assessment
Screening from Cohort Phase-I
Clearance from DRC, DRB and Ethical Committee
CTRI Registration
Assessed for eligibility
n= (based on pilot study) 10
Pre-assessment for Star excursion, BBS, MIDAS, EEG waveform, WHOQoL SF-12
Screened women from Cohort Phase I will be randomly allocated into 2 groups
Group A
Vestibular Rehabilitation (Integrated exercises), Lifestyle Modifications & Relaxation
Group B
Conventional Therapy, Lifestyle Modifications & Relaxation
Post-assessment (after intervention)
Star excursion, BBS, MIDAS, EEG waveform, WHOQoL SF-12

GROUP A: Vestibular Rehabilitation (Integrated Exercises)

[Clendaniel, R. A.; 2010; Shaabani, M., Shahrokhi, A., Soufinia, B., Javanbakht, M., & Bakhshi, E.; 2017]

WEEK	NAME	REPETITIONS	SETS	TOTAL TIME
1	**GS:** Horizontal and vertical *1 viewing exercise with near target, 1-minute duration, sitting	1	1	
	HE: Large amplitude, rapid cervical rotation (horizontal or vertical), each set of exercises consisted of 5 complete movements (cycles) and the individual performed 3 sets, sitting	1	1	
	VSR:			**15 mins**
	• Standing up & sitting down with eyes open & with eyes closed	3	1	
	• Standing with eyes closed & feet open and feet closed	1	1	
	• Standing with tandem gait	1	1	
	• One-leg stand on the right foot & one-leg stand on the left	1	1	
	• 180° turn to the left and right	3	1	
	• Walking for 10 m	1	1	
	• Walking with horizontal and vertical head movements for 10 m	1	1	
2	**GS:** Horizontal and vertical x1 viewing exercise with near target, 2-minute duration, sitting	1	1	
	HE: Large amplitude, rapid horizontal cervical rotation (seated) and standing pivots, or large amplitude, rapid vertical cervical rotation (seated) and seated trunk flexion-extension, 3 sets of 5 cycles	1	1	**15 mins**
	VSR:			
	• Standing up & sitting down with eyes open & with eyes closed	3	1	
	• Standing with eyes closed &	1	1	

	feet open and feet closed • Standing with tandem gait • One-leg stand on the right foot & one-leg stand on the left • 180° turn to the left and right • Walking for 10 m • Walking with horizontal and vertical head movements for 10 m	1 1 3 1 1	1 1 1 1 1	
3	**GS:** Horizontal and vertical x1 viewing exercise with near and far targets, 2-minute duration, standing **HE:** Large amplitude, rapid horizontal and vertical cervical rotation (seated) and standing pivots, or large amplitude, rapid horizontal and vertical cervical rotation (seated) and seated trunk flexion-extension,3 sets of 5 cycles **VSR:** • Standing up & sitting down with eyes open & with eyes closed • Standing with eyes closed & feet open and feet closed • Standing with tandem gait • One-leg stand on the right foot & one-leg stand on the left • 180° turn to the left and right • Walking for 10 m • Walking with horizontal and vertical head movements for 10 m	1 1 3 1 1 1 3 1 1	1 1 1 1 1 1 1 1 1	**15 mins**
4	**GS:** Horizontal and vertical x1 viewing exercise with near and far targets, and targets located in front of a busy background, 2-minute duration, standing **HE:** Large amplitude, rapid horizontal and vertical cervical rotation (seated), standing pivots, and seated trunk flexion-extension, 3 sets of 5 cycles	1 1	1 1	

	VSR: • Standing up & sitting down with eyes open & with eyes closed • Standing with eyes closed & feet open and feet closed • Standing with tandem gait • One-leg stand on the right foot & one-leg stand on the left • 180° turn to the left and right • Walking for 10 m • Walking with horizontal and vertical head movements for 10 m	3 1 1 1 3 1 1	1 1 1 1 1 1 1	**15 mins**
5	**GS:** Horizontal and vertical x1 viewing exercise with near and far targets, and targets located in front of a busy background. Horizontal and vertical x2 viewing exercise, plain background. All exercises are 2 minutes in duration, standing **HE:** Large amplitude, rapid horizontal and vertical cervical rotation (standing), standing pivots, and seated trunk flexion-extension,3 sets of 5 cycles **VSR:** • Standing up & sitting down with eyes open & with eyes closed • Standing with eyes closed & feet open and feet closed • Standing with tandem gait • One-leg stand on the right foot & one-leg stand on the left • 180° turn to the left and right • Walking for 10 m • Walking with horizontal and vertical head movements for 10 m	1 1 3 1 1 1 3 1 1	1 1 1 1 1 1 1 1 1	**15 mins**
6	**GS:** Horizontal and vertical x1 viewing exercise with near and far targets, and targets located in front of a	1	1	

	busy background. Horizontal and vertical x2 viewing exercises background. All exercises are 2 minutes in duration, standing **HE:** Large amplitude, rapid horizontal and vertical cervical rotation (standing), standing pivots (180 degrees), seated trunk flexion-extension, and Brandt-Daroff exercise 3 sets of 5 cycles **VSR:**	1	1	
	• Standing up & sitting down with eyes open & with eyes closed	3	1	**15 mins**
	• Standing with eyes closed & feet open and feet closed	1	1	
	• Standing with tandem gait	1	1	
	• One-leg stand on the right foot & one-leg stand on the left	1	1	
	• 180° turn to the left and right	3	1	
	• Walking for 10 m	1	1	
	• Walking with horizontal and vertical head movements for 10 m	1	1	

Table 1

GROUP B: Conventional Exercises

WEEK	NAME	REPETITIONS	SETS	TOTAL TIME
1	Craniocervical flexion in a relaxed, supine lying position Cranio-cervical extension, flexion, and rotation in a prone-on-elbow position while maintaining the cervical spine in a neutral position	10 (10 s hold)	2	**15 mins**
2	Craniocervical flexion in a relaxed, supine lying position Cranio-cervical extension, flexion, and rotation in a prone-on-elbow position while maintaining the cervical spine in a neutral position	10 (10 s hold)	2	**15 mins**
3	Craniocervical flexion in a relaxed, supine lying position Cranio-cervical extension, flexion, and rotation in a prone-on-elbow position while maintaining the cervical spine in a neutral position	10 (10 s hold)	2	**15 mins**
4	Craniocervical flexion in a relaxed, supine lying position Cranio-cervical extension, flexion, and rotation in a prone-on-elbow position while maintaining the cervical spine in a neutral position	10 (10 s hold)	2	**15 mins**
5	Head lift for flexors (supine) & neck extension for the extensor group (4-pt kneeling)	15 (3 s rest between each rep)	1	**15 mins**
6	Head lift for flexors (supine) & neck extension for the extensor group (4-pt kneeling)	15 (3 s rest between each rep)	1	**15 mins**

Table 2

[Benatto, M. T., Florencio, L. L., Bragatto, M. M., Dach, F., Fernández-de-las-Peñas, C., & Bevilaqua-Grossi, D.; 2022]

Group A and Group B (Warm-Up, Lifestyle Modifications & Relaxation)

WEEK	NAME	ACTIVITY	TOTAL TIME
1	**WARM-UP**	Self-stretching of neck muscles including neck flexor, rotator, and side flexors, the isometric exercise of neck muscles including cervical flexors, extensors, and side flexors	**2-3 mins**
	LIFESTYLE MODIFICATIONS Restful sleep Mealtime Regularity Light Aerobic Exercises Elimination of dietary triggers	Maintain a regular sleep schedule Regular Meals Low-moderate intensity aerobic exercise Avoid known migraine triggers	**7-8 hours**
	RELAXATION Deep Breathing exercises	Regulates the autonomic nervous system, promoting relaxation and potentially reducing migraine frequency.	**5-7 mins**
	Progressive Muscle Relaxation (PMR)	The technique is a two-step process. It involves learning to relieve the tension in specific muscle groups by first tensing and then relaxing each muscle group. When the muscle tension is released, attention is directed toward the differences felt during tension and relaxation so that the patient learns to recognize the contrast between the states	
2	**WARM-UP**	Self-stretching of neck muscles including neck flexor, rotator, and side flexors, the isometric exercise of neck muscles including cervical flexors, extensors, and side flexors	**2-3 mins**
	LIFESTYLE MODIFICATIONS Restful sleep		**7-8 hours**

	Mealtime Regularity Light Aerobic Exercises Elimination of dietary triggers **RELAXATION** Deep Breathing exercises Progressive Muscle Relaxation (PMR)	Maintain a regular sleep schedule Regular Meals Low-moderate intensity aerobic exercise Avoid known migraine triggers Regulates the autonomic nervous system, promoting relaxation and potentially reducing migraine frequency. The technique is a two-step process. It involves learning to relieve the tension in specific muscle groups by first tensing and then relaxing each muscle group. When the muscle tension is released, attention is directed toward the differences felt during tension and relaxation so that the patient learns to recognize the contrast between the states	**5-7 mins**
3	**WARM-UP** **LIFESTYLE MODIFICATIONS** [21] Restful sleep Mealtime Regularity Light Aerobic Exercises Elimination of dietary triggers **RELAXATION** Deep Breathing exercises Progressive Muscle Relaxation (PMR)	Self-stretching of neck muscles including neck flexor, rotator, and side flexors, the isometric exercise of neck muscles including cervical flexors, extensors, and side flexors Maintain a regular sleep schedule Regular Meals Low-moderate intensity aerobic exercise Avoid known migraine triggers Regulates the autonomic nervous system, promoting relaxation and potentially reducing migraine frequency. The technique is a two-step process. It involves learning to relieve the tension in specific muscle groups by first tensing and then relaxing each muscle group. When the muscle tension is	**2-3 mins** **7-8 hours** **5-7 mins**

		released, attention is directed toward the differences felt during tension and relaxation so that the patient learns to recognize the contrast between the states	
4	**WARM-UP** **LIFESTYLE MODIFICATIONS** Restful sleep Mealtime Regularity Light Aerobic Exercises Elimination of dietary triggers **RELAXATION** Deep Breathing exercises Progressive Muscle Relaxation (PMR)	Self-stretching of neck muscles including neck flexor, rotator, and side flexors, the isometric exercise of neck muscles including cervical flexors, extensors, and side flexors Maintain a regular sleep schedule Regular Meals Low-moderate intensity aerobic exercise Avoid known migraine triggers Regulates the autonomic nervous system, promoting relaxation and potentially reducing migraine frequency. The technique is a two-step process. It involves learning to relieve the tension in specific muscle groups by first tensing and then relaxing each muscle group. When the muscle tension is released, attention is directed toward the differences felt during tension and relaxation so that the patient learns to recognize the contrast between the states	**2-3 mins** **7-8 hours** **5-7 mins**
5	**WARM-UP** **LIFESTYLE MODIFICATIONS** Restful sleep Mealtime Regularity	Self-stretching of neck muscles including neck flexor, rotator, and side flexors, the isometric exercise of neck muscles including cervical flexors, extensors, and side flexors Maintain a regular sleep schedule	**2-3 mins** **7-8 hours**

	Light Aerobic Exercises Elimination of dietary triggers **RELAXATION** Deep Breathing exercises Progressive Muscle Relaxation (PMR)	Regular Meals Low-moderate intensity aerobic exercise Avoid known migraine triggers Regulates the autonomic nervous system, promoting relaxation and potentially reducing migraine frequency. The technique is a two-step process. It involves learning to relieve the tension in specific muscle groups by first tensing and then relaxing each muscle group. When the muscle tension is released, attention is directed toward the differences felt during tension and relaxation so that the patient learns to recognize the contrast between the states	**5-7 mins**
6	**WARM-UP** **LIFESTYLE MODIFICATIONS** Restful sleep Mealtime Regularity Light Aerobic Exercises Elimination of dietary triggers **RELAXATION** Deep Breathing exercises Progressive Muscle Relaxation (PMR)	Self-stretching of neck muscles including neck flexor, rotator, and side flexors, the isometric exercise of neck muscles including cervical flexors, extensors, and side flexors Maintain a regular sleep schedule Regular Meals Low-moderate intensity aerobic exercise Avoid known migraine triggers Regulates the autonomic nervous system, promoting relaxation and potentially reducing migraine frequency. The technique is a two-step process. It involves learning to relieve the tension	**2-3 mins** **7-8 hours** **5-7 mins**

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ANNEXURES

ANNEXURE 1

STRAW Criteria

Seven stages of normal reproductive aging in women

The STRAW staging system[+]

						Final Menstrual Period (FMP)		
Stages	−5	−4	−3	−2	−1	0	+1	+2
Terminology	Reproductive			Menopausal Transition		Postmenopause		
	Early	Peak	Late	Early	Late*		Early*	Late
				Perimenopause				
Duration of stage	Variable			Variable		(a) 1 yr	(b) 4 yrs	Until demise
Menstrual cycles	Variable to regular	Regular		Variable cycle length (> 7 days) different from normal	≥2 skipped cycles and an interval of amenorrhea (≥60 days)	*Amen x 12 mos*	None	
Endocrine	Normal FSH		Elevated FSH	Elevated FSH		Elevated FSH		

*Stages most likely to be characterized by vasomotor symptoms. [+]Stages of Reproductive Aging Workshop, held in Park City, Utah, USA, July 23-24, 2001, sponsored by the American Society for Reproductive Medicine, the National Institute on Aging, the National Institute of Child Health and Human Development, and the North American Menopause Society.

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ANNEXURE 2

Diagnostic Criteria for Vestibular Migraine according to ICHD-3

Table 1. Main diagnostic criteria (left) and notes (right) of VM (ICHD-3)

A. At least five episodes fulfilling criteria C and D	
B. *A current or past history of Migraine without aura or Migraine with aura*	Code also for the underlying migraine diagnosis
C. *Vestibular symptoms intense enough to either interfere or prevent daily activities, lasting between 5 min to 72 h*	Duration highly variable, lasting for: • Minutes (about 30% of patients) • Hours (30%) • Days (30%) • Seconds only, which tend to happen during head motion, visual stimulation or changes in head position (10%). In these patients, episode duration is defined as the total period during which short attacks recur • There are patients who may take 4 weeks to recover *fully* from an episode
D. *At least half of episodes associated with 1, 2 or 3:* *1. Headache with at least two of the following:* *a) unilateral location* *b) pulsating quality* *c) moderate or severe intensity* *d) aggravation by routine physical activity* *2. Photophobia and phonophobia* *3. Visual aura*	• One symptom is sufficient during a single episode • Different symptoms may occur during different episodes • Associated symptoms may occur before, during or after the vestibular symptoms
E. *Not better accounted for by another ICHD-3 diagnosis or by other vestibular disorder (OVD)*	• History and physical examinations do not suggest OVD • OVD ruled out by appropriate investigations • OVD present as a comorbid condition but episodes can be clearly differentiated • Migraine attacks may be induced by vestibular stimulation • The differential diagnosis should include OVD complicated by superimposed migraine attacks

ANNEXURE 3

Berg Balance Scale

Name: _____

Rater: _____

BERG BALANCE SCALE
14-Item Long Form Original Version

Date: _____

1. SITTING TO STANDING
INSTRUCTIONS: Please stand up. Try not to use your hands for support.
(4) able to stand without using hands and stabilize independently
(3) able to stand independently using hands
(2) able to stand using hands after several tries
(1) needs minimal aid to stand or to stabilize
(0) needs moderate or maximal assist to stand

2. STANDING UNSUPPORTED
INSTRUCTIONS: Please stand for two minutes without holding.
(4) able to stand safely 2 minutes
(3) able to stand 2 minutes with supervision
(2) able to stand 30 seconds unsupported
(1) needs several tries to stand 30 seconds unsupported
(0) unable to stand 30 seconds unassisted If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

3. SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL
INSTRUCTIONS: Please sit with arms folded for 2 minutes.
(4) able to sit safely and securely 2 minutes
(3) able to sit 2 minutes under supervision
(2) able to sit 30 seconds
(1) able to sit 10 seconds
(0) unable to sit without support 10 seconds

4. STANDING TO SITTING
INSTRUCTIONS: Please sit down.
(4) sits safely with minimal use of hands
(3) controls descent by using hands
(2) uses back of legs against chair to control descent
(1) sits independently but has uncontrolled descent
(0) needs assistance to sit

5. TRANSFERS
INSTRUCTIONS: Arrange chairs(s) for a pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.
(4) able to transfer safely with minor use of hands
(3) able to transfer safely definite need of hands
(2) able to transfer with verbal cueing and/or supervision
(1) needs one person to assist
(0) needs two people to assist or supervise to be safe

6. STANDING UNSUPPORTED WITH EYES CLOSED
INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.
(4) able to stand 10 seconds safely
(3) able to stand 10 seconds with supervision
(2) able to stand 3 seconds
(1) unable to keep eyes closed 3 seconds but stays steady
(0) needs help to keep from falling

7. STANDING UNSUPPORTED WITH FEET TOGETHER
INSTRUCTIONS: Place your feet together and stand without holding.
(4) able to place feet together independently and stand 1 minute safely
(3) able to place feet together independently and stand for 1 minute with supervision
(2) able to place feet together independently but unable to hold for 30 seconds
(1) needs help to attain position but able to stand 15 seconds feet together
(0) needs help to attain position and unable to hold for 15 seconds

( ) TOTAL SCORE (Maximum = 56) ,a person scoring below 45 is considered to be at risk for falling.

8. REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING
INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the finger reaches while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.).
(4) can reach forward confidently >25 cm (10 inches)
(3) can reach forward >12 cm safely (5 inches)
(2) can reach forward >5 cm safely (2 inches)
(1) reaches forward but needs supervision
(0) loses balance while trying/requires external support

9. PICK UP OBJECT FROM FLOOR FROM A STANDING POSITION
INSTRUCTIONS: Pick up shoe/slipper which is placed in front of your feet.
(4) able to pick up slipper safely and easily
(3) able to pick up slipper but needs supervision
(2) unable to pick up but reaches 2-5cm (1-2 inches) from slipper and keeps balance independently
(1) unable to pick up and needs supervision while trying
(0) unable to try/needs assist to keep from losing balance or falling

10. TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING
INSTRUCTIONS: Turn to look directly behind you over toward left shoulder. Repeat to the right. Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.
(4) looks behind from both sides and weight shifts well
(3) looks behind one side only other side shows less weight shift
(2) turns sideways only but maintains balance
(1) needs supervision when turning
(0) needs assist to keep from losing balance or falling

11. TURN 360 DEGREES
INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.
(4) able to turn 360 degrees safely in 4 seconds or less
(3) able to turn 360 degrees safely one side only in 4 seconds or less
(2) able to turn 360 degrees safely but slowly
(1) needs close supervision or verbal cueing
(0) needs assistance while turning

12. PLACING ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED
INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.
(4) able to stand independently and safely and complete 8 steps in 20 seconds
(3) able to stand independently and complete 8 steps >20 seconds
(2) able to complete 4 steps without aid with supervision
(1) able to complete >2 steps needs minimal assist
(0) needs assistance to keep from falling/unable to try

13. STANDING UNSUPPORTED ONE FOOT IN FRONT
INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width).
(4) able to place foot tandem independently and hold 30 seconds
(3) able to place foot ahead of other independently and hold 30 seconds
(2) able to take small step independently and hold 30 seconds
(1) needs help to step but can hold 15 seconds
(0) loses balance while stepping or standing

14. STANDING ON ONE LEG
INSTRUCTIONS: Stand on one leg as long as you can without holding.
(4) able to lift leg independently and hold >10 seconds
(3) able to lift leg independently and hold 5-10 seconds
(2) able to lift leg independently and hold = or >3 seconds
(1) tries to lift leg unable to hold 3 seconds but remains standing independently
(0) unable to try or needs assist to prevent fall

ANNEXURE 4

Star Excursion Balance Test

Patient's full name: _____ Date accomplished: _____

Conductor's full name: _____

What you need:

- A flat surface (2x2 meters)
- Sticky tape
- Measuring tape

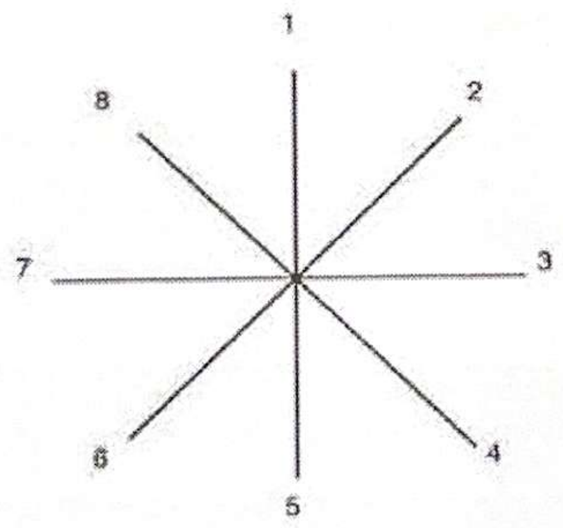
What your patient needs:

Comfortable lightweight clothing or fitness clothing

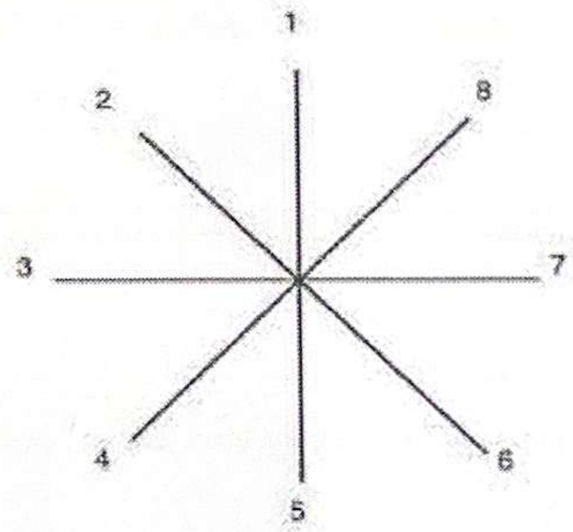
Instructions:

- Make an asterisk using sticky tape. Make sure they are 6 to 8 feet long. All ends of the asterisk should be separated by a 45-degree angle.
- First, have your patient pick one leg to use as their standing leg. This leg will be used to balance themself throughout half of this exercise.
- Tell them to get into standing position in the middle of the asterisk and have them place their hands on their hips.
- Once they are in a standing position, they will use their other leg to reach as far as they can within the range of each direction of the asterisk but without planting their reaching foot on the ground.
- To reach for each direction, they will have to use their big toe. If they're using their left leg as their standing leg, then they will use their right leg to reach. If that's the case, then they will reach for each direction in clockwise order. If they're using their left leg to reach for each direction, they will do this in counterclockwise order.

Standing on LEFT leg



Standing on RIGHT leg



- They will have to repeat this three times per leg. Make sure to give them a trial run first, so technically, they will do this four times per leg.

They will fail if:

- If they hold onto something for balance
- If they lose their balance and fall
- They remove their hands from their hips
- If they plant their reaching foot on the ground
- If their standing foot's heel rises or moves at all

ANNEXURE 5

WHOQoL SF-12

SF-12 Health Survey

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. **Answer each question by choosing just one answer.** If you are unsure how to answer a question, please give the best answer you can.

1. In general, would you say your health is:

☐1 Excellent ☐2 Very good ☐3 Good ☐4 Fair ☐5 Poor

The following questions are about activities you might do during a typical day. Does <u>your health now limit you</u> in these activities? If so, how much?

	YES, limited a lot	YES, limited a little	NO, not limited at all
2. **Moderate activities** such as moving a table, pushing a vacuum cleaner, bowling, or playing golf.	☐1	☐2	☐3
3. Climbing **several** flights of stairs.	☐1	☐2	☐3

During the <u>past 4 weeks</u>, have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	YES	NO
4. **Accomplished less** than you would like.	☐1	☐2
5. Were limited in the **kind** of work or other activities.	☐1	☐2

During the <u>past 4 weeks</u>, have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?

	YES	NO
6. **Accomplished less** than you would like.	☐1	☐2
7. Did work or activities **less carefully than usual.**	☐1	☐2

8. During the <u>past 4 weeks</u>, how much <u>did pain interfere</u> with your normal work (including work outside the home and housework)?

☐1 Not at all ☐2 A little bit ☐3 Moderately ☐4 Quite a bit ☐5 Extremely

These questions are about how you have been feeling during the <u>past 4 weeks</u>.
For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the <u>past 4 weeks</u>...

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
9. Have you felt calm & peaceful?	☐1	☐2	☐3	☐4	☐5	☐6
10. Did you have a lot of energy?	☐1	☐2	☐3	☐4	☐5	☐6
11. Have you felt down-hearted and blue?	☐1	☐2	☐3	☐4	☐5	☐6

12. During the <u>past 4 weeks</u>, how much of the time has your <u>physical health or emotional problems</u> interfered with your social activities (like visiting friends, relatives, etc.)?

☐1 All of the time ☐2 Most of the time ☐3 Some of the time ☐4 A little of the time ☐5 None of the time

Patient name: Date: PCS: MCS:

Visit type (circle one)
Preop 6 week 3 month 6 month 12 month 24 month Other:_____

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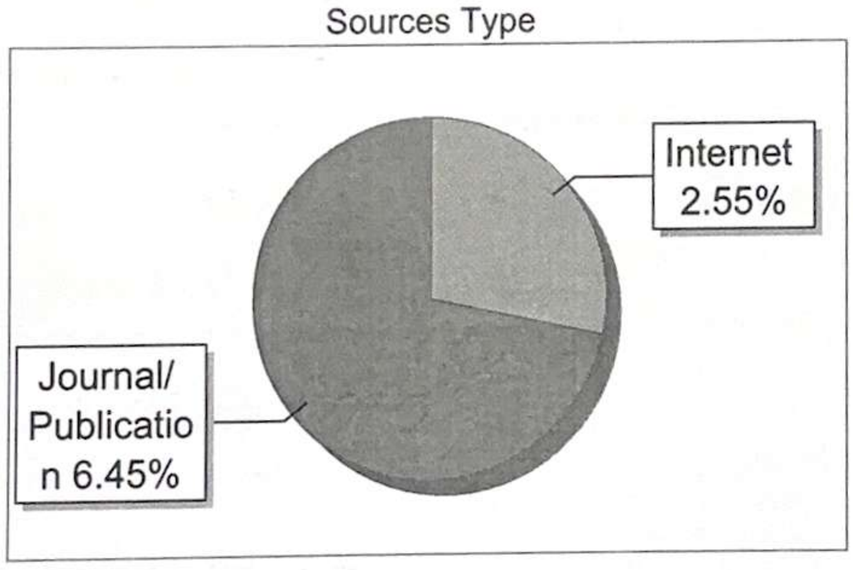

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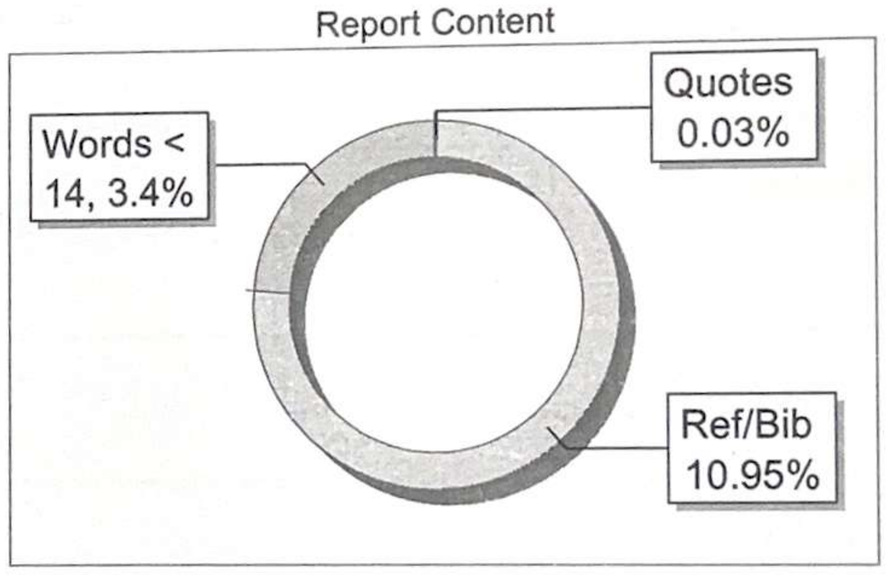

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3	www.longdom.org	1	Publication
4	www.longdom.org	1	Publication
5	ccsenet.org	<1	Publication
7	Vestibular Migraine Diagnosis of Vestibular Migraine, by Wetmore, Stephen R- 2015	<1	Publication
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